Appendix 12

Beginning with Habitat

Appendix 12 A: *Beginning with Habitat* Manual
http://www.beginningwithhabitat.org/pdf/BWHtext.pdf

Appendix 12 B: *Beginning with Habitat* in Northern and Eastern Maine

Beginning with Habitat in Northern and Eastern Maine

Maine Department of Inland Fisheries and Wildlife

Over the last decade, several state agencies and non-governmental groups initiated a landscape planning effort for southern Maine to address the need to conserve habitats and natural resources in the face of sprawl and other development issues. This evolved into the Beginning with Habitat Project that is based on conserving riparian habitats, high value animal and plant habitats, and large blocks of upland habitat. This project is based on a cooperative, non-regulatory approach working through towns, local land trusts, etc.

Landscape planning in northern Maine for habitat and natural resource conservation has not been directly addressed by this same group. A number of large forest landowners have initiated their own efforts particularly in regard to riparian habitat and more recently incorporating the marten habitat model developed at University of Maine. While regulation of habitats (e.g., deer wintering areas) has been in place for a number of years, this approach and other single-species habitat conservation efforts are not meeting the need to address habitats and natural communities as part of forest management at the landscape scale.

To develop a set of recommendations for landscape planning in northern and eastern Maine, a working group was formed. Based on input from Inland Fisheries and Wildlife staff and other members of the working group (see list of participants attached), we identified three goals related to landscape planning for northern and eastern Maine. Implementation of the recommendations to achieve these goals and meet the identified objectives is dependent on voluntary actions and cooperative efforts by landowners and land managers.

Goals:

1. Maintain sufficient habitat to support all native plant and animal species currently breeding in Maine (Beginning with Habitat goal)

2. Maintain healthy, well-distributed populations of native flora and fauna.

3. Maintain a complete and balanced array of ecosystems.

Desired Outcomes/Objectives:

We also identified seven desired outcomes, or objectives, to address these goals as part of a landscape planning process. These include:

1. Maintain and increase number of large blocks of forest.

2. Conserve high value plant and animal habitats.

3. Protect natural communities.

4. Provide adequate early successional habitat for wildlife species.

5. Conserve riparian areas/wetlands.

6. Increase amount and distribution of late successional habitats.

7. Minimize impact of roads.

Specific goals and/or recommendations have been developed to address these desired outcomes in order to meet the broader goals. Supporting documentation and rationale for these recommendations are also included.

During the process of developing the goals and objectives for this process, we sought to achieve consensus. Specific recommendations are based on the input of the group and the specialists who contributed drafts of various sections. Final recommendations are based on agreement of majority of the participants and as approved by Maine Department of Inland Fisheries and Wildlife.

LANDSCAPE PLANNING RECOMMENDATIONS

1. Maintain and increase number of large blocks of forest

A) Large landscape management units >10,000 acres are recommended for forest landscape planning and management.

B) Manage habitat units of >1250 acres within the larger landscape units for marten habitat. To ensure marten viability, maintain an average of 7, and no fewer than 2, of these habitat units in every township. Marten strongly select for stands > 40 feet tall with > 30% winter canopy closure and with residual basal areas of trees > 80 ft^2/acre.

C) Use even-aged management of some units on longer rotations to produce large contiguous stands of forest.

D) Create habitat units that are non-linear (i.e., not long and narrow).

E) Retain some areas of late-successional forest both within large blocks of relatively mature forest and within young forest. Spatially clustering harvest operations and/or extending rotations can accomplish this.

F) Protect special or unique habitats embedded within large blocks.

G) Minimize disturbance caused by road building and use temporary roads whenever possible to access cutting units. Plan spacing of permanent roads.

H) Maintain connectivity between large blocks of similar age via riparian zones or other natural features.

I) Within the constraints indicated by FPA, large clearcuts or forest practices that create large even-aged early successional stands on the landscape that mature over time should be encouraged.

2. Conserve high value plant and animal habitats.

A) Gather the available data from the appropriate agencies (MDIFW, MNAP, LURC). High value plant and animal habitat information is available to landowners from MDIFW and MNAP.

B) These habitats should be located and conserved or managed to maintain their conservation values. Each of these habitats and documented species locations, as well as hardwood stands containing beech, are important to the conservation and management of the plant, fish and wildlife resources of the State of Maine.

Many northern Maine landowners have coordinated with MNAP and MDIFW for updated surveys of rare animals, rare plants, and exemplary natural communities. Subsequently, many landowners have taken voluntary steps to ensure that these species and exemplary natural communities on their lands are protected. Plant (non-federal species) and natural community data from MNAP is non-regulatory.

C) Some of the regulated habitats (e.g., bald eagle nest sites, LURC deer wintering areas) require specific management or protection actions.

D) Other habitats can be addressed in context of riparian habitat management, cooperative agreements, etc.

3. Protect natural communities.

A) Information on rare and exemplary natural communities should be obtained from MNAP.

B) Landowners should grant special protection to exemplary natural communities. In many cases, this means avoiding the area all together, but in some cases forest management may be compatible.

Natural community data from MNAP is non-regulatory.

4. Provide adequate early successional habitat for wildlife species.

Historically, 3-7% of the upland forests in the Acadian forest were in early successional habitats (Seymour *et al*. 2002; Lorimer and White, In Press). In addition, lowland forests along waterways were greatly affected by the cutting of trees and building of dams by beaver (Naiman *et al*. 1988). While the amount of early successional habitats created by beavers in Maine's presettlement forest is unknown, it probably equaled or exceeded amounts in upland forest based on what is seen today when beaver populations are at or near carrying capacity (e.g., Acadian National Park in the 1980s).

Assuming that the goal of current forest management is to mimic historical disturbance patterns:

A) The amount of early successional habitat in Maine should be increased and maintained at around 10-15% of the landscape (distributed half upland, half lowland).

B) Some of this habitat, again following historic disturbance regimes (Seymour *et al*. 2002), should be in large patches (i.e., half to whole townships in early habitats) with the phases highly interspersed.

C) To reach these goals, there will have to be an increase in the use of clear-cutting in Maine, and this will probably require changes in the MFPA to ease the administrative process for permitting this type of forest management.

5. Conserve riparian areas/wetlands.

Riparian ecosystems are among the most ecologically important and sensitive ecosystems in forested landscapes. Following the management guidelines provided below (modified from Elliott 1999) will help conserve the biodiversity values associated with these critical ecosystems:

A) Establish fixed (by stream order or wetland type) or variable (based on slope, floodplain size, and intensity of adjacent harvest) riparian management zones along stream, rivers, ponds, and wetlands that exceed the minimum standards required by LURC and DEP statutes. Riparian management zones have been recently developed by several prominent ecological forestry-based initiatives in Maine and elsewhere, and are summarized in Table 1.

B) Employ Maine Forest Service Best Management Practices (BMPs) for protecting soils and water quality when operating in or near riparian areas.

C) Employ forest management systems, such as single-tree or small-group selection cuts, that retain relatively continuous forest canopy cover (>70%) in riparian management zones.

D) Consider a limited no-cut zone (25-100 ft is often recommended, smaller on lower order streams) immediately adjacent to the stream or wetland shoreline, particularly in areas containing steep slopes, shallow or poorly drained soils and areas of intensive adjacent harvest.

E) Avoid forest management actions that lead to semi-permanent or permanent conversion of the natural vegetation within riparian management zones including placement of log landings, logging roads, and plantations.

F) Use streams as stand boundaries to reduce the need for stream crossings. When stream crossings are unavoidable conform to Maine Forest Service's BMPs for erosion control.

G) Bridges and culverts should be large enough to pass peak flows (from 100-year storm events) without damage to the structure and should not constrict the stream channel. Culverts, preferably with flat bottoms, should be installed at the level of the original streambed to provide fish, amphibian, and invertebrate passage at all flows.

H) Retain snags, trees with cavities or extensive rot, downed logs, and large super-canopy trees to the greatest extent possible in the riparian management zone.

I) Avoid using fertilizers, pesticides, and chemicals within riparian management zones and, if applied aerially, institute wide spray buffers (>1/4 mile) to prevent impacts from incidental drift.

J) Apply special precautions to riparian management zones in aquatic systems hosting rare, threatened, or endangered species and natural communities. Consult with MDIFW and MNAP biologists for standards -- e.g. riparian management zone width, linear extent, and canopy closure -- when operating in the vicinity of these elements.

Table 1. Recommended width of riparian management zones as presented by various ecological forestry-based initiatives.

Aquatic System	TNC (2000) St. John River Watershed[1]	International[2] Paper (2003)	Maine Council on SFM (1996)	NH Forest Sustainability Standards (1997)	Maine Forester's Guide (1988)[3]	MDIFW's ET Forester's Guide (1999)
1st & 2nd-order streams (includes intermittent)	50-250 ft. (50ft. no-cut)	100 ft. (75 ft unmapped streams)	75 ft.[4]	100 ft.		75-100 ft. (25 ft. no-cut)
3rd-order streams	100-500 ft. (100ft. no-cut)	330 ft.	250 ft.	300 ft. (25 ft. no-cut)	100-330 ft.	250-330 ft. (25 ft. no-cut)
4th-order streams	1000 ft. (no-cut)	660 ft.	250 ft.	600 ft. (25 ft. no-cut)	100-330 ft.	250-600 ft. (25 ft. no-cut)
Ponds < 10 acres	125 ft. (no-cut)	250 ft (25 ft. no-cut)		100 ft.		75-100 ft. (25 ft. no-cut)
Ponds > 10 acres	250 ft. (no-cut)	250 ft (25 ft no cut)		300 ft. (25 ft. no-cut)	100-330 ft.	250-300 ft. (25 ft. no-cut)
Permanent Wetlands	50-125 ft. (no-cut)	0 ft if forested; 100-250 ft if <10 acres, nonforested, or Significant Habitat (25 ft no-cut)		100-300 ft. (0-25 ft. no-cut)		75-330 ft. (25 ft. no-cut)
High Value Vernal Pools[5]	50-125 ft. (no-cut)	100 ft (low-cut)		200 ft. (50 ft. low-cut)		400ft (100 ft. low-cut)

1 No-cut zones are expanded up to 250 ft. in areas where wind-throw hazards, saturated soils, or steep slopes make soil compaction or scarification possible. Additional riparian protection is provided by inclusion of "expansion areas" (300-600-acre blocks designed to support forest interior birds and several pine marten ranges) spaced at ~1-2 mile intervals along stream corridors.

2 Additional guidelines established for percent volume removed, time period for removal, and residual basal area by stand type for all categories below.

3 100 ft. is recommended for watercourses draining <50 mi^2 and 330 ft. is recommended for watercourses draining >50 mi^2.

4 Recommend no clearcutting within 250 ft.

5 Consult: Calhoun, A.J.K. and P. deMaynadier. 2004. Forestry Habitat Management Guidelines for Vernal Pool Wildlife. MCA Technical paper No. 6, Wildlife Conservation Society, Bronx, New York.

Increase amount and distribution of late successional habitats.

Lorimer (1977) estimated that around 1800, 84% of northern Maine's forest was older than 75 yrs, and 59% was older than 150 yrs. If these numbers even roughly represent the natural age class distribution of the forest, there is no realistic prospect of mimicking such an age class distribution now or in the future on managed forestland.

A Late-successional Index for forest stands is currently under development in Maine that essentially scores a stand, structurally and compositionally, in relation to old-growth in the region (intolerant hardwoods and softwoods have separate scoring categories) (A. Whitman, pers. comm.). Such an index could be a tool that can be used in achieving some management recommendations listed below:

A) Retain any current stands of any size that qualify as late successional (for example, a score ≥8 of 10 on L-S Index is a potential indicator of this type of forest).

B) If (1) is not feasible, harvest stands in ways that retain as much L-S content as possible. Use a "legacy retention" strategy to keep L-S features and species (e.g., large-trees, old trees, large snags, large downed wood; see Whitman and Hagan 2003 for a 'how to' discussion).

C) Allocate 10% of the landscape to a late-successional management regime (LSMR), and well-distribute these management areas throughout the ownership (one example might be three 800-1000 acre LSMRs in a typical 25,000 acre township, but other scenarios should be considered based on existing spatial opportunities or constraints). Use relict late-successional stands as a guide for selecting late-successional management regime areas. The LSMR would not be off-limits to harvesting, but special consideration of maintaining and rebuilding L-S forest would be a primary goal in the LSMR. From the Biodiversity section of the Sustainability Indicators (DOC/MFS), the amount of land in "high basal area in large sawtimber" is 2.8% statewide.

D) Use patch retention in clearcut, shelterwood, and selection cut stands as a mechanism to retain late-successional structures throughout the landscape and not just in LSMRs (Whitman and Hagan 2003).

E) Restoration to late-successional status of some stands should be pursued in areas where late-successional forest is lacking.

F) Use riparian buffers to help retain well-distributed L-S stands throughout the landscape, but do not rely exclusively on riparian zones to provide L-S content.

6. Minimize impact of roads.

Goal is to minimize the negative impact of roads on wildlife by enhancing connectivity, siting new roads with wildlife in mind, discontinuing unnecessary roads, minimizing road widths and densities, and protecting and encouraging road less areas.

A) New roads/density – Upgrade existing roads rather than build new roads, plan the efficient lay out of new roads to minimize the total area of land converted, limit permanent road construction to the lowest density possible. For example Woodley and Forbes currently recommend a maximum of one mile of permanent road per square mile to help maintain biodiversity of forest ecosystems in the Fundy Model Forest (see Pelletier 1999). This goal can be compared to the current norm in Maine in which a hypothetical Maine township with a grid of roads ½ mile on center, conforming to the rule of thumb maximum skidding distance of ¼ mile would require 66 miles of roads or 1.8 miles or road per square mile of land.

B) Road Design –

   a. Road width: To achieve higher speeds some landowners are increasing their road widths to 70-80 feet, with running surface 20 feet. According to research by deMaynadier, cited above, significant effects for amphibians were found from a road ~40ft wide (+~5 ft of verge). Based on this work, forest roads should be constructed to be <40 ft with little or no verge clearance. Narrower road widths are also important for Deer Wintering Areas, primarily in softwood areas in order to keep some type of canopy closure over road.

C) Road Straightness: The increase in straight roads may cause valuable habitat types to be impacted, such as wetlands, and other significant flora and fauna. Road should be built to conform to the landscape, not build through the landscape to fit the road.

D) Road closures – Coordinate road closures among landowners to restore a road less condition to designated blocks at the township-scale, thereby ensuring large undeveloped habitat blocks.

E) Road access - Limit access by gating or blocking roads when they are no longer required or when public access can cause harm to protect fragile or over-used resources, thus preventing some of the negative incidental impacts (disturbance and exploitation) of increased public access to remote areas.

F) Riparian areas – Avoid building roads that cut through wetlands or near or between major wetlands. If these situations are unavoidable raise road up and install culverts for amphibian under passages.

RATIONALE AND DOCUMENTATION

1. Maintain and increase number of large blocks of forest.

Definitions and Need

The value of managing forests in larger units or blocks in northern Maine to benefit forest interior wildlife and large-area requiring species has been previously recognized. R.T.T. Forman (1995) outlined several major ecological advantages of large patches. Wildlife values include such things as 1) habitat to sustain populations of patch interior species, 2) core habitat and escape cover for large-home-range vertebrates, 3) source of species dispersing through the matrix, and 4) microhabitat proximities for multi-habitat species. Large patches have repeatedly been found to contain higher species richness than many small patches, notably because they contain patch interior specialists whereas small patches have high numbers of edge and edge-interior species. Some forest interior species require large tracts because their required habitat exists only some distance from forest edge. Others require large tracts in order to breed successfully because they are particularly vulnerable to edge effect predation. In addition, the shape of a stand can affect the value to these species. A circular stand is preferable to a long linear stand (Oliver and Larson 1996).

Several recent studies have shown the importance of forest block size to many species and that reproductive behaviors may be disrupted in relatively small patches. For instance, in newly formed forest fragments, Hagan et al. (1996) found higher densities of Ovenbirds, yet a lower rate of pairing success than in larger areas of forest. In Pennsylvania, a 20-fold difference in the number of young Ovenbirds fledged was observed between large (10,000 ha) and small (9.2-183.2 ha) blocks of forests (Porneluzi et al. 1993). In general, species that are higher in the food chain are more sensitive to patch size. The loss of these high trophic-level species that typically require large areas (i.e., “area sensitive) can cause widespread ecological effects. Protecting large patches of habitat containing these predators helps to sustain species richness (Forman 1995) and area sensitive species such as American marten can be useful umbrella species for biodiversity planning efforts (Hepinstall and Harrison 2004).

Habitat loss, coupled with the additive effects of fragmentation of the remaining mature or relatively mature forest blocks reduces the value of the habitat available to forest specialists or large-area species (Chapin et al. 1998). Fragmentation also limits ability of less mobile species to reinvade nearby disturbed patches depending on isolation of habitat patches. Since the passage of the Maine Forest Practices Act in 1989, which placed restrictions on the size of clearcuts, there has been a shift away from large-block clearcutting in northern Maine. One result is smaller clearcut harvest units, which can lead to smaller and more fragmented patches of habitat where that system is used. Due to a number of factors, including simple avoidance of the FPA restrictions, increased confidence that alternative sivicultural techniques can produce the desired results, and a change in ownership objectives, we have seen a shift away from clear-cutting towards shelterwood harvesting and various forms of partial harvesting. Because the size shelterwood harvests is not limited by the FPA, this system can be used to create large blocks of early-successional forest. Likewise the clearcut method can be used to create a large-block mosaic of early-successional habitat by harvesting separation zones after the FPA regeneration standard has been met. Alternatively, the selection system and other forms or partial harvests can be used to maintain large blocks of relatively mature to mature forest. However, any form of harvesting, especially those that deviate significantly from natural disturbance patterns, can potentially have adverse impacts on wildlife if cumulative landscape impacts are not considered.

Hunter and Seymour (1989) recommended 10,000-acre landscape management units for participation in a voluntary incentive program for forest management. In 1996, the Department of Conservation (DOC) defined a Landscape Planning Unit (LPU) as a planning area of about 25,000 contiguous acres to “Maintain healthy, well distributed flora and fauna and complete and balanced array of different types of ecosystems” (Maine Council on Sustainable Forest Management, MDOC 1996). The basic rationale behind this desired outcome of landscape planning is that planning units of this size are capable of supporting species that require large blocks of relatively mature to mature forest while simultaneously meeting the needs to of early-successional species and those with special habitat needs. But a large LPU is not the same as a large patch. One could have a 25,000 acre LPU and still do management units as a checkerboard within it with large blocks of mature, early successional and other habitats maintained.

At the management level within the landscape unit, the “habitat units” may be considerably smaller, i.e., this is about proportion of the landscape in different age classes that is a separate issue from patch size. Based on the sustainable forest management benchmarks for biodiversity established by the Department of Conservation (Sustaining Maine's Forests: Criteria, Goals, and Benchmarks for Sustainable Forest Management Maine Council on Sustainable Forest Management July 1996), the DOC recommended for landowners who own over 500 contiguous acres that the combined area of relatively mature and mature forests should constitute at least 60% of an ownership and 40% of the forests within any LPU, while mature forests should constitute at least 30% of the ownership and 20% of any LPU. These recommendations are currently undergoing revision and update.

The Northern Goshawk is an example of a mature large block species. Goshawk habitat blocks with high potential need to be >5000 acres of mature forest with 60-90% canopy closure. To assure reproduction, timber harvest should avoid the entire feeding range and maintain prime habitat (mature coniferous, deciduous, or mixed forest). Occupation and success of nesting decrease as overstory trees are removed and stands become fragmented. About 1600 acres of prime foraging habitat will provide core habitat for one breeding male and about 415 acres for breeding females with fledged young (Squires and Reynolds 1997; Crocker 1990). Marginal habitats for the Goshawk include: regeneration, light partial cuts, clearcuts, forested wetlands, shrub-scrub, heavy partial cuts and peatland.

Chapin et al. (1998) and others at University of Maine have developed landscape-planning recommendations by using the American marten as an indicator species. Martens are considered the most area-sensitive, forest-specialized mammals inhabiting northern Maine. Although martens will use a variety of stand maturity classes and over story types, they strongly select for stands > 40 feet tall with > 30% winter canopy closure and with residual basal areas of trees > 80 ft^2/acre (Payer and Harrison 2003). However, the University of Maine research indicates that despite the presence of suitable marten habitat requirements at the stand-scale, martens are absent from potential home ranges (1-2 mi^2 areas) where >60% of forest stands do not qualify as suitable marten habitat. In fact, home ranges of resident martens are typically composed of >75% stands that are above the thresholds for stand-scale occupancy described above. Further, home ranges are usually centered on a single forest patch ranging from one-half to one square mile in area, and marten will not aggregate across several small patches to meet their home range-scale requirements for large patches. Thus, landscapes with small dispersed clearcuts and highly interspersed areas of residual and partially harvested stands, or with residual basal areas of dominant overstory trees stocked at < 80 ft^2/acre, or with <30% winter canopy closure will lose their ability to support resident marten (Fuller 1999, Payer and Harrison 2003). Hence, planning and foresight is necessary for maintaining home ranges of martens in extensively and intensively managed forest landscapes.

Hepinstall and Harrison (2004) developed a simple model that can be used to predict occupancy of potential home ranges by martens with > 70% accuracy. This model is useful for measuring and projecting marten populations through time by evaluating different forest management alternatives. They recommend planning to maintain an average of 7, and no fewer than 2, habitat units (with a >75% probability of supporting resident marten) of 2 square miles, about 1250 acres, each (14 mi^2 total average in planning units) in every township. The goal should be to maintain at least one patch of 700-1000 acres in each habitat unit meeting the structural features required by marten (not necessarily unharvested). This approach would promote maintenance of the minimum habitat required to support an average of 5 resident-male and 10 resident-female martens per township across the landscape. Management should be directed toward maintaining at least one patch of 700-1000 acres meeting structural features required by marten (i.e., not necessarily unharvested) within each 1250-acre management unit. Chapin and Harrison (1998) reported that 70% of occupied home ranges of marten were composed of a single suitable habitat patch.

Maintenance of large blocks of habitat for marten can be a powerful tool to ensure that broad-scale biodiversity objectives are achieved. Hepinstall and Harrison (2004) also evaluated the utility of using marten as an umbrella species for forest wildlife conservation. Their results indicate that planning for marten habitat across commercially managed landscapes would disproportionately benefit (this means other species receive an equal or greater benefit compared to martens) greater than 75% of forest-dependent generalist and specialist vertebrate wildlife species occurring in northern Maine. Thus, landscape-scale planning to maintain or enhance marten habitat is a powerful tool for landowners seeking to meet broad-scale biodiversity objectives and could enhance overall landscape sustainability.

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2. Conserve high value plant and animal habitats.

Definitions and Need

High Value Plant and Animal Habitats include Rare Plant Locations and Rare or Exemplary Natural Communities (see separate section addressing Natural Communities); Essential Habitat (designated for some endangered animals); Significant Wildlife Habitat (for deer, waterfowl and wading birds, nesting seabirds, and shorebirds); and Rare Animal Locations (for endangered species and species of special concern) as identified and mapped by the Maine Natural Areas Program and the Department of Inland Fisheries and Wildlife. Some of these are coastal habitats that will not be encountered in forests of northern and eastern Maine.

Many of our wildlife laws, and most of the wildlife research and science conducted by state and federal agencies, are a direct response to threats to wildlife and their habitats. Deer wintering areas need to be protected because over-harvesting of forest resources in these areas can destroy protective winter habitat. Fishing, trapping, and hunting regulations are designed to ensure that populations are not over-harvested. Researching and mapping of habitat for endangered and threatened species provides us with the information needed to secure a future for rare plants and animals.

High Value Plants and Natural Communities

The Maine Natural Areas Program ’s (MNAP) mission is to ensure the maintenance of Maine ’s natural heritage for the benefit of present and future generations. MNAP facilitates informed decision-making in development planning, conservation, and natural resources management through the collection, interpretation, and dissemination of information on rare, threatened, and endangered plant species. The MNAP is a division of the Maine Department of Conservation.

MNAP Rare Plant Locations designate specific points where populations of rare, threatened, and endangered plants (State Ranks S1, S2, or S3) have been documented and, for many species, habitat for the respective plants.

S1 Critically imperiled in Maine because of extreme rarity (5 or fewer occurrences)
S2 Imperiled in Maine because of rarity (6-20 occurrences)
S3 Rare in Maine (over 20-100 occurrences)
S4 Apparently secure in Maine
S5 Demonstrably secure in Maine

The habitat in which these plants occur is important for their survival. Rare Plant Locations may occur either outside of or within in documented MNAP Rare and Exemplary Natural Communities. Rare plants are often components of documented natural communities and can be conserved in the context of these larger systems. Populations of rare plants outside of documented natural communities may require separate conservation actions.

High Value Wildlife Habitats

The Maine Department of Inland Fisheries and Wildlife ’s (MDIFW) legal charge is “to preserve, protect and enhance the inland fisheries and wildlife resources of the State.”

MDIFW supervises an outdoor legacy on 17.9 million forested acres, 32,000 miles of rivers and streams, 6,000 lakes and ponds, and approximately 2,000 coastal islands.

Essential Wildlife Habitats are a product of Maine 's Endangered Species Act (MESA), which requires that both Endangered and Threatened (E&T) animals, and their necessary habitats, be protected. Essential Habitats are areas determined to be essential to the conservation of species and they must be identified and mapped by MDIFW to be formally protected. Any project within an Essential Habitat that requires a state or municipal permit, or that is funded or conducted by the state or a municipality, requires MDIFW review. This action rarely stops development. In fact, in the past, most development has proceeded, but MDIFW biologists work to modify the project so E&T animals and their habitat are protected. Maine has 34 animals listed as Endangered or Threatened (49 total if federal and state species are included). Only a fraction (<1/4) of this total includes species with forest management concerns. At the moment, MDIFW has established Essential Habitat for only 4 of these: piping plovers, least terns, roseate terns, and bald eagles. Of the four species for which Essential Habitats exist, only bald eagles nest in northern Maine. Not all animals on Maine's endangered species list require Essential Habitat designation to ensure their survival.

Significant Wildlife Habitats (SWH) include: habitat for Endangered and Threatened species; high and moderate value deer wintering areas and travel corridors; high and moderate value waterfowl and wading bird habitats; shorebird nesting, feeding, and staging areas; seabird nesting islands; significant vernal pools (not mapped); and nursery areas for Atlantic salmon (not mapped). These habitats are mapped as a product of the Natural Resources Protection Act (NRPA), a law passed in 1988 to prevent degradation of significant state resources. This law provides for the habitat identification and mapping for animals that have very specific habitat requirements. To date, only seabird-nesting islands have received formal designation as Significant Wildlife Habitat. Other candidate Significant Wildlife Habitats have yet to receive full legal designation, but various state agencies reviewing development applications refer to these mapped data for guidance on permitting. Conservation management should address documented by not "adopted" SWHs.

Other Rare Wildlife Data contains Endangered and Threatened species habitats, other rare animal habitats, "species of special concern" that may be very rare or vulnerable, for which biologists are gathering more information.

The Land Use Regulation Commission protects additional wildlife habitats as P-FW. LURC Statute TITLE 12, M.R.S.A., Chapter 206-A LAND USE REGULATION, Chapter 10 Land Use Districts and Standards defines Fish and Wildlife Protection Subdistricts (P-FW). These include significant fish spawning nursery and feeding areas, critical habitat of Endangered and Threatened wildlife species, habitat of fish or wildlife needing special protection, shelter portions of deer wintering areas as defined in Chapter 10 –2.b and seabird nesting islands (only deer wintering areas are addressed in this document).

Although, not formally regulated habitats with beech and other mast producing species should be addressed through forest management practices.

3. Protect natural communities.

The Maine Natural Areas Program's mission is to ensure the maintenance of Maine's natural heritage for the benefit of present and future generations. MNAP facilitates informed decision-making in development planning, conservation, and natural resources management through the collection, interpretation, and dissemination of information on rare plants and rare or exemplary natural communities. The MNAP is a division of the Maine Department of Conservation.

A natural community is a system of interacting plants and their common environment, recurring across the landscape, where the effects of human intervention are minimal. As described in the state's natural community classification (Gawler and Cutko 2003), there are currently 98 natural community types and 35 broader ecosystem types known in Maine. Roughly thee-fourths of these types occur in northern and eastern Maine.

MNAP tracks two broad classes of natural communities recognized as important for conservation: any examples of "rare" types (i.e., those ranked S1, S2, or S3), and exemplary natural communities or outstanding examples of common types (i.e., those ranked S4 or S5).

S1 Critically imperiled in Maine because of extreme rarity (5 or fewer occurrences)
S2 Imperiled in Maine because of rarity (6-20 occurrences)
S3 Rare in Maine (over 20-100 occurrences)
S4 Apparently secure in Maine
S5 Demonstrably secure in Maine

Examples of rare natural communities in northern Maine include circumneutral riverside seeps and jack pine forests. Examples of common natural community types in northern Maine include beech–birch–maple forests and sheep laurel dwarf shrub bogs. Some exemplary natural communities often coincide with other mapped habitats (e.g., spruce – cedar seepage forests and deer wintering areas), so special management of one area may have multiple benefits for biodiversity. Most common natural communities have been impacted by land use practices, and it is unusual to find relatively large undisturbed examples of them (e.g., large stands of old growth forest). Rare and Exemplary Natural Communities represent the natural legacy of habitat types for our state. The long-term conservation of our natural heritage depends on protecting these areas.

Within the last ten years many northern Maine landowners have coordinated with MNAP to conduct surveys on their lands for rare plants and natural communities. Subsequently, many landowners have taken voluntary steps to ensure that exemplary natural communities on their lands are protected. Such efforts have been encouraged by forest certification efforts and large-scale conservation easements.

4. Provide adequate early successional habitat for wildlife species.

Definition and Ecology

Early successional habitats are those structural life forms of vegetation that occur naturally after a forest stand is destroyed or removed by cutting, insects, fire, or wind. After a stand replacing disturbance, early successional wildlife habitats proceeds sequentially with time through the following phases: (a) bare ground to grasses and forbs; (b) to a mixture of grasses, forbs, seedlings and shrubs; (c) to predominantly young, dense, brush; (d) to taller and still dense brush; and lastly to (e), taller, but less dense brush. Once a stand is predominated by pole-sized tress, it is considered “young forest,” not “early successional” (see Sepik *et al*. 1981: Figure 1).

Rationale and Need

Importance – Early successional habitats are used by many wildlife species in several ways. For some species, such as black bear and moose, part of their food needs are met in some of the phases. Specifically, bear feed in phases (b) and (c), and to a lesser extent (d) and (e) during the spring, summer, and fall whereas moose obtain much of their winter food in phases (c) though (e). While some species obtain only part of their needs from early successional habitats, other species are more dependent on these habitats. The American woodcock, for example, obtains essentially all its needs from early successional habitats. Woodcock are declining in Maine and nationally, and the decline of this important game bird is thought to be the result a reduction in habitat (Kelley 2003). Woodcock reach their highest densities in areas where large amounts of the different phases of early successional habitats are well interspersed. This is because woodcock use phases (a) and (b) for spring courtship and mating, and nighttime roosting spring through fall; (c) and (d) for daytime feeding and chick rearing; and (d), (e), and pole-sized forests for nesting (Sepik *et al*. 1981). Increase the distance between these phases and woodcock have to travel farther, increasing risk and at some point reducing survival. Eliminate any one of these phases in an area, however, and woodcock are unable to complete their life cycle.

Issue – With the control of forest fires and insects, clear-cutting is the primary mechanism for the creation of early successional habitats in Maine. With passage of the Maine Forest Practices Act in 1989 (MFPA), restrictions were placed on the use of clear-cutting as a silvicultural practice. While over 90% of the cutting done in Maine prior to the Act was clear-cutting, now approximately 96% of the forestry practiced in Maine is partial cutting (i.e., selection and shelterwood harvesting; annual statistics from the Maine Forest Service, Augusta, ME). While more information is needed, it is clear that partial harvests do not create the full range of phases, nor patch sizes and interspersion patterns, created by clear-cutting. Thus, there is concern that without stand replacing forest practices, woodcock and other species associated with early successional habitats, including snowshoe hare and Canada lynx (Hoving 2001), will be negatively affected.

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5. Conserve riparian areas/wetlands.

Definition

Riparian ecosystems comprise a zone of ecological transition between aquatic and terrestrial systems. Specific definitions as to the physical extent of riparian ecosystems vary greatly depending on the breadth of functional values included, from water quality to wildlife habitat.

Minimally, most definitions include a) the shoreline of lentic and lotic waterways (perennial and seasonal streams, rivers, ponds, and all types of wetlands), b) the upland area influenced by these aquatic systems, and c) the area of adjacent uplands directly influencing the aquatic system. For the purposes of our discussion, the riparian ecosystem extends from the edge of an aquatic system (stream bank for example) to its furthest extent into adjacent uplands. Definitions addressing wildlife habitat functions may be centered entirely in the riparian system or overlap with adjacent aquatic and/or upland systems.

Background and Biodiversity Value

Riparian areas are among the most critical parts of any forest ecosystem, because of the diverse ecological values they provide (Hunter 1990). Both structurally complex and ecologically dynamic, many scientists have argued that riparian areas are also among the most sensitive systems to environmental change. Some of the specific biodiversity values provided by a well-managed, ecologically functioning riparian zone include (Elliott 1999):

- Prevention of degradation of wetland habitat and water-quality;
- Buffering of aquatic and wetland plants and animals from disturbance;
- Provision of important riparian plant and animal habitat; and
- Contributions of organic matter, nutrients, insects, and structural complexity to aquatic systems

Wildlife Values

Although they make up a relatively small proportion of the forest landscape, riparian ecosystems often host some of the greatest species richness. For example, riparian zones, and their associated wetland systems, are utilized by over 90% of the northeastern region's vertebrate species and provide the preferred habitat for over 40% of these species (DeGraaf et al. 1992).

Like the ecotone itself, the suite of species benefiting from forested riparian ecosystems varies along a continuum from aquatic species, to riparian specialists, to upland forest species. Obligate aquatic species such as fish, wading birds, and aquatic invertebrates benefit from the maintenance of water quality, nutrient input, habitat structure (e.g. woody debris dams), and disturbance-buffer values provided by forested riparian zones. Riparian specialists such as shoreland-nesting ducks (e.g. goldeneyes, mergansers, wood ducks), floodplain wildflowers, wood turtles, dragonflies, and mink frequent the aquatic-riparian gradient while fulfilling life-history requirements. Finally, a variety of largely upland species, from flycatchers to white-tailed deer, reach peak densities during certain seasons in forested riparian ecosystems because of optimal foraging opportunities (e.g. high insect densities, soft and hard mast abundance) or preferences for riparian nesting or travel corridors.

In landscapes where intensive forest management is practiced, forested riparian ecosystems often serve as de-facto refuges for late successional-associated species that prefer the structural complexity of mature forests. Among others, these characteristics include high crown height and closure (e.g. deer wintering areas), abundant standing and downed dead wood (e.g. cavity-nesters, shrews, and salamanders), diverse tree species and diameter classes (e.g. bark and foliage gleaning passerines, and lichens), and well-developed pit and mound topography and wind-throw (e.g. herbs, small mammals, northern waterthrush, winter wren and other root mass nesters).

Water Quality and Organic Inputs

Riparian vegetation provides numerous water quality, food-chain, and structural values with the major ones including (Castelle and Johnson 2000):

- Streambank stabilization – determined in part by the density and depth of herbaceous and woody streambank roots and multi-stemmed vegetation which slow moving waters (and ice);
- Sediment reduction – both by canopy reduction of raindrop impacts and the slowing of surface sheet flow;
- Chemical and nutrient removal – including metals, excess nutrients, and other chemicals by filtering subsurface water via plant uptake;
- Shade production – water temperature increases when streamside vegetation, particularly overhead canopy, is reduced which in turn affects fish and aquatic insect species composition and growth both locally and far downstream.
- Organic inputs and debris structure – particularly important in lower order stream systems where the foodchain is fueled primarily by detrital inputs and where debris dams provide valuable microhabitat structure.

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6. Increase amount and distribution of late successional habitats.

Definition and Ecology

The term "late-successional" is often used in conjunction with "old-growth" forest (Hemstron et al. 1998), though neither term has a universally agreed upon definition (Hunter 1989, Leverett 1996). "Late-successional" forest implies a forest that is nearing one of potentially several old stages of forest condition after a relatively long period without major a stand-replacing disturbance (either by humans or natural causes). "Old-growth" is similar, except that it represents the functional end of the continuum of forest development when (1) tree species composition has stabilized, (2) net annual growth is close to zero, (3) the forest is older than the average time between natural disturbances that lead to succession, and (4) the dominant trees are at the average life expectancy for the species (Hunter 1989 1990). Sometimes a prior break in stand continuity as a result human activity (conversion to agriculture or timber harvesting) disqualifies a stand as being old-growth, but what exactly constitutes a break in continuity is also subject to debate. The ultimate determinant of what constitutes old growth should be whether species and processes characteristic of old-growth are indeed present and viable/functional. By this definition, it may be that many late-successional stands contain the same species and processes as old-growth, and therefore are worthy of conservation attention, especially if other stands in the landscape lack these characteristics. For Maine, a good working definition of late-successional forest might be: any mature forest stand in which there is a component of canopy trees that are 100+ years old, regardless of prior timber extraction. This definition includes stands that might have been partially cut in the past, leaving behind some trees that today are greater than 100 years old. Even stands commercially clearcut 100+ years ago may now be acquiring late-successional characteristics and may merit special attention.

Rationale

Importance- It is yet unclear whether any species is entirely dependent on old-growth or late-successional forest. However, it is clear that many species can be at risk of extirpation or extinction because of the loss of old forest, even if they are not exclusively restricted to old-growth forest. In Finland, an estimated 5% of forest species are predicted to go extinct in the next 50 years as a result of modern forest practices (Hanski 2000); most of these species depend on structural characteristics of old forest, such as large old living trees, standing snags, or fallen dead wood. The same pattern has been reported in Sweden where a disproportionate number of red-listed (=threatened and endangered) species are related to old forest or habitat elements associated with old forest (Berg et al. 1994). Scandinavian forests are quite similar to Maine's forests, and even share many of the same non-vertebrate forest species. Scientists are beginning to understand the importance of older forest to many species, and that stand continuity can be key to maintenance of many less charismatic components of biodiversity, such as some mosses, fungi, lichens, and insects (e.g., Selva 1994, Nilsson et al. 1995, Bredesen et al. 1997, Gauslaa and Ohlson 1997, Håkan et al. 1997, Arseneau et al. 1998, Franklin et al. 2000, Jonsell and Nordlander 2002). "Continuity" refers to the persistence of big trees, big logs, and other structural and compositional attributes of old forest in the same stand over a very long period of time (one or more centuries). In general, vertebrates appear to be less tightly linked to late-successional forest than non-vertebrates, although some are dependent on the same late-successional structural attributes for nesting, roosting, or denning. Since many forest species evolved in a time when old, senescent forests constituted a major part of the forested landscape (e.g., Lorimer 1977), it is not surprising that many species evolved to make use of habitat characteristics that develop in this age class. The conservation challenge is to retain enough of this forest age class, or structural attributes that develop in this age class, that species can be maintained in a well-distributed manner throughout their natural range.

Issue- In forests managed for timber it is financially problematic to maintain late-successional and old-growth stands. Such stands tend to be in, or near, a steady state condition, where as much wood is dying each year as is growing. Such a stand condition (sometimes referred to as “overmature” in forestry terms) represents future lost income. From a financial perspective it is important to convert such silviculturally stagnant stands to growing stands. This can be achieved in many ways, dependent on the tree species present and landowner goals. But it always involves a human-induced disturbance (harvest). It is not uncommon that late-successional stands are treated with a one- or two-stage shelterwood prescriptions, whereby within 10-20 years the stand is converted to a young stand, with little or no remaining late-successional structure. Once such structure is lost, it could take a century or more for these stands to develop into the late-succesional age class (if allowed), and even longer for the stand to be recolonized by late-successional species.

Based on the operation definition of “late-successional” provided above, many late-successional stands still exist in Maine’s industrial forest today. These stands are relicts of a time when not all tree species were of economic value (especially hardwoods), or when many stands were not accessible. Due to changes in wood markets, the advent of engineered lumber, and a much more extensive road network, remaining late-successional stands are rapidly disappearing. In less than a decade, most remaining stands likely will be gone. Yet these stands could be crucial to (1) maintaining species well-distributed in Maine that are tightly linked to late-successional forest, and (2) helping to restore late-successional species in the surrounding landscape. For example, several species of lichen and moss appear to be linked to large, old shade-tolerant tree species. These species are often absent from younger stands. When they *are* present in younger stands, they tend to be on old, remnant trees that for one reason or another were left during the last harvest entry.

Unfortunately we do not know how much late-successional forest is needed to maintain viable populations of species that are linked to older forest. At present, late-successional forest may be rare enough (ca. 0-4% of most unorganized townships managed for timber) that an argument to maintain all such stands could be made, or at least to harvest them in such a way as to retain late-successional structure and species composition. Indeed, when such stands are encountered in Sweden’s industrial forest, they are automatically protected by the landowner (referred to as “key woodland habitats”) (L. Gustafsson, pers. comm). Regardless of the approach taken, lack of attention to this forest age class is certain to result in continued, and rapid loss of this forest age class from the working forest landscape.

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7. Minimize impact of roads.

Definition and Background

Roads are access routes through and to forested areas, including wide, permanent, high-traffic thoroughfares; narrow, grassy, woods trails; and temporary trails used to remove wood.

Roads of all kinds have seven general effects: mortality from road construction, mortality from collision with vehicles, modification of animal behavior, alteration of the physical environment, alteration of the chemical environment, spread of exotics, and increased use of areas by humans (see Trombulak and Frissell 2000). As roads become larger or more permanent with greater traffic volume and speed, their effects on biodiversity increase. The effects of roads can extend over some distance from their centers, such that their "effective widths" can be many times their actual widths. Due to the road-zone effect, 15-20% of the land base of the United States is ecologically impacted by roads (see Forman and Alexander 1998).

The number of miles of forest-management roads in Maine has increased dramatically since the early 1970s, and has shifted from mainly temporary to more-permanent roads. It is estimated that in 1996 there were over 25000 miles of privately owned forest roads in Maine (not including skid trails), surpassing in length the state's existing public highway system. In addition, between 500 and 1000 miles of forest-management roads are built annually (see Pelletier 1999).

Rationale

Issues/Considerations – For viable animal populations and their persistence over time, animals need to be able to move through the landscape, move among populations, disperse freely and recolonize lost areas. Effects of roads on vertebrate populations act along three lines: direct effects, such as habitat loss and fragmentation; road use effects, such as traffic causing vertebrate avoidance or road kill; and additional facilitation effects, such as over hunting or over trapping, which can increase with road access (see Gucinski~~,~~ et al. 2001). The effect of road mortality on wildlife populations increases one or two wildlife generations after the road has been in place, whereas the effects of a road as a barrier will likely take several wildlife generations to be observed (see Forman, Richard T.T. et al. 2003).

- Edge effect/Habitat fragmentation – Dissecting vegetation patches increases the edge-affected area and decreases interior area. In general, road building fragments habitat and creates habitat edge, thereby modifying the habitat in favor of species that use edges. Edge-dwelling species generally are not threatened, however, because the human-dominated environment has provided ample habitat for them. In addition, road edges my act as a predator sink as many predator species travel these edges due to changes created in habitat from road building.

- Road kill - Because many forest roads are not designed for high-speed travel, and the speed of traffic is directly related to the rate of mortality, direct mortality on forest roads is not usually an important consideration for large mammals. The exception to this may be the increase in through roads on industrial timberland that are built for speed and safety (straightness) many of which are better then asphalt roads. Traffic volume should be considered on these larger roads in relation to larger mammals however; even low levels of road mortality could be an issue for an endangered species such as the Canada Lynx. Forest roads pose a greater hazard to small, slowly moving, migratory animals, such as amphibians, making them highly vulnerable as they cross even narrow forest roads. In addition to reducing population size and causing higher possible local extinction rates, roads (through road kill) act as barriers for amphibians during their seasonal migration to and from wetlands and vernal pools.

- Avoidance – some sensitive species will avoid roads, including large mammals, some songbirds, small mammals, amphibians and insects (see deMaynadier and Hunter 2000, Mader 1984, and Swihart and Slade 1984). Avoidance behavior will separate populations and reduce usable habitat size, effectively causing habitat fragmentation.

- Access – Increased access can result in the overuse of previously unexploited resources such as over-fishing a small pond or over-harvesting furbearers in remote areas. In addition, for mountain lions, wolves and black bears, the issue isn't that roads serve as barriers, or that they are even avoided when encountered, rather that increased human access into previously remote road less areas leads to poaching and exploitation of species with already low population densities. Road construction also allows human development in previously remote areas.

Aquatic Habitat – Gravel roads that are improperly constructed or poorly maintained can cause sedimentation and siltation of streams and other water bodies, adversely affecting fish and aquatic organisms. Also roads can change hydrology, flooding areas above the road or leading to concentration of runoff and erosion below.

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